DETAILED ACTION

Response to Amendment

1. Applicant's amendments of 02/25/10 have been entered. Claims 1-21 are currently under examination on the merits. The previous 112 2nd and 1st paragraph rejections remain and new 112 2nd paragraph rejections have been raised based on applicant's amendments.

Examiner's Note

2. The use of produce-by-process limitations has been noted in claim 1, such as, for example, "electrospun." Even though a product-by-process is defined by the process steps by which the product is made, determination of patentability is based on the product itself. In re Thorpe, 777 F.2d 695, 227 USPQ 964 (Fed. Cir. 1985). As the court stated in Thorpe, 777 F.2d at 697, 227 USPQ at 966 (The patentability of a product does not depend on its method of production. In re Pilkington, 411 F.2d 1345, 1348, 162 USPQ 145, 147 (CCPA 1969). If the product in a product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.).

Claim Rejections - 35 USC § 112

3. Claims 1-21 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 1 recites that an optical precursor is incorporated into the electrospinning solution. There is insufficient support for this limitation in the specification. The remainder of the claims are likewise rejected for being dependent on the above mentioned claim.

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 1-21 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1 recites that an optical material is incorporated into the electrospinning solution and then later recites that an optical material is coated or doped on the already formed (i.e. electrospun) fiber. It is therefore vague and indefinite if there is an implicit requirement for two optical materials, one in the fiber before it is formed and one after it is formed.

6. Claim 1 now also recites that the nanofibers is coated or doped with "the at least one optical material or at least one optical material" which renders the claim vague and indefinite for similar reasons set forth above (i.e. it is unclear if **the** optical material is different from the later mentioned "at least one optical material." If applicant intends two different optical materials the used of terms such as "first" and "second" is recommended.

7. The remainder of the claims are likewise rejected for being dependent on the above mentioned claim.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

10. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

11. Claims 1-5, 7, 8 and 15-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goldstein et al. (U.S. 5,356,487) in view of Dzenis et al. (U.S. 6,265,333) and further in view of Sennet et al. (U.S. 2002/0096246).

12. Regarding claim 1, Goldstein et al. discloses a high surface areas (i.e. small diameter) carbonized fiber containing rare earth oxides (optically active in the IR spectra) having a nanometer scale diameter (i.e. less than 1 micron) (C5, L5-C6, L15). Goldstein et al. does not disclose electrospinning as a method of making the polymeric fibers which are later carbonized although he does disclose that the fibers are advantageously as small as possible in order to more rapidly heat and cool the fibers when used in the thermovoltaic device (C1, L30-45 and C5, L55-

60). Dzenis et al. discloses that electrospinning is a method of producing polymeric fibers at extremely small diameters (C8, L10-C9, L40). Hence it would have been obvious to have used electrospinning, as taught by Dzenis et al., to produce the polymeric fibers of Goldstein et al. While Goldstein et al. discloses using optical precursors (nitrates of a desired oxide e.g. aluminum nitrate to form aluminum oxide) to be converted into the desired optical oxides during the carbonization step (C5, L50-C6, L15) the reference does not explicitly disclose that the precursors be incorporated into the polymeric solution of the fiber (rather they are disclosed as being impregnated into the fiber after it is formed). Sennet et al. discloses that it was known to incorporate (i.e. dope) additives, including reactive compounds and catalysts, into the polymeric solution prior to the actual forming of the fiber ([0031]). Hence it would have been obvious to have incorporated the nitrates (i.e. optical precursors) of Goldstein et al. into the polymeric solution prior to the formation of the fibers because it would eliminate the extra step of impregnating the fibers after they are formed and therefore reduce the cost to manufacture the fibers.

Regarding claims 2-5, 7, 8 and 15-21, Goldstein discloses all of the limitations as set forth above. Additionally, with respect to claims 2-4, 15, 20, Goldstein et al. discloses that the fiber is carbonized (C6, L5-15) and that it contain ytterbia and erbium (C5, L60-65). With respect to claim 5, the fiber is also disclosed as containing silica (C5, L10-15). With respect to claim 7 and 8, Erbium oxide produces colors in the near IR spectrum and the amounts used produce a noticeable emittance of radiation (C1, L30-45). With respect to claim 17-19, the use of the rare-earth fiber is with other fibers in a composite structure (i.e. fabric) (See Fig. 2A and 2B) for energy conversion in a thermophotovoltaic device ((C1, L30-45, thermal energy is

converted to photovoltaic energy). With respect to claim 16, the emission of infrared radiation as a result of exposure to combustion (C1, L30-45) makes the device a chemical sensor in that is senses combustion. With respect to claim 21, Sennet discloses the doping of the electrospinning mixture as explained in the rejection of claim 1 above.

13. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Goldstein et al. (U.S. 5,356,487) in view of Dzenis et al. (U.S. 6,265,333) and further in view of Sennet et al. (U.S. 2002/0096246) as applied to claim 1 above, and further in view of Tatarchuk et al. (U.S. 5,102,745).

Regarding claim 6, modified Goldstein et al. discloses all of the limitations as set forth above. Goldstein et al. does not disclose the inclusion of a catalyst within the fiber composite.

Tatarchuk et al. discloses that it was known in the art to provide catalyst particles within multifiber composite networks (See abstract) due to the flexibility and low pressure drop of the catalyst containing fiber composite structure as compared to a packed bed structure (C10, L45-65).

The inventions of both modified Goldstein et al. and Tatarchuk et al. are drawn to the field of multifiber composite networks and therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to have modified the fiber composite of modified Goldstein et al. by adding catalysts as taught by Tatarchuk et al. for the purposes of utilizing the structure as a flexible catalyst support.

14. Claims 9-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goldstein et al. (U.S. 5,356,487) in view of Dzenis et al. (U.S. 6,265,333) and further in view of Sennet et al.

(U.S. 2002/0096246) as applied to claim 1 above, and further in view of Milstein et al. (U.S. 5,601,661)

Regarding claim 9-14, modified Goldstein et al. discloses all of the limitations as set forth above. Additionally, modified Goldstein et al. discloses altering the amount of rare earth metal oxide in the overall composite from between 1-99 wt%. Goldstein et al. does not specifically disclose the amounts of rare earth metal in the infrared functional fibers.

Milstein et al. discloses that the composition in a mixture of a base oxide (aluminum oxide) and a rare earth oxide (ytterbium) can be altered between 0% ytterbium and 90% ytterbium (C3, L40-C4, L20), which completely overlap the claimed ranges. Milstein et al. discloses that relative amounts of rare earth metal to base material effect the theremophotovoltaic properties, as well as the mechanical strength properties of the composition (C4, L1-20).

The inventions of both modified Goldstein et al. and Milstein et al. are drawn to the field of thermophotovoltaic compositions and therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to have modified the amount of rare earth metal in the optically functional nanofibers of modified Goldstein et al. as taught by Milstein et al. for the purposes of optimizing the thermophotovoltaic and mechanical strength properties.

15. Claims 1 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dzenis et al. (U.S. 6,265,333) in view of Elbert et al. (U.S. 3,565,910),

16. Regarding claims 1 and 21, Dzenis et al. discloses electrospun nanofibers made of, inter alia, nylon (C8, L10-45) for use in composites resistant to environmental conditions (C1, L20-25). Dzenis et al. does not disclose that optical materials be doped into the solution before electrospinning however, Elbert et al. discloses a nylon composition containing pigments which

would be beneficial for use as the base material for the electrospun polymer of Dzenis et al. because of its heat and light stabilized properties (i.e. environmental stability). The composition of Elbert et al. is disclosed as containing carbon black in order to adjust the shading of the color (C5, L65-C6, L5). The inventions of both Dzenis et al. and Elbert et al. are directed towards environmentally stable compositions and therefore it would have been obvious to one having ordinary skill in the art to have adjusted the nylon polymer of Dzenis et al. by using the stabilized nylon composition of Elbert et al. for the purposes of imparting increased environmental stability.

Response to Arguments

17. Applicant's arguments filed on 02/25/10 are considered moot in light of the new grounds of rejection which were necessitated by applicant's amendments. Arguments which are still deemed valid are addressed below.

18. Applicant argues against the 112 1st paragraph rejection on the grounds that the specification discloses one species of optical precursor material and therefore provides support for the amendments. The examiner disagrees. The specification's mentioning of specific optical precursor materials does not provide support for applicant to broadly claim all optical precursor materials. There are certainly various specific types of optical precursor materials (i.e. materials that later become transparent or opaque or fluorescent or a particular color) which are currently within the scope of claim 1 and which are not supported by the instant specification. Therefore the new matter rejection is proper and is maintained.

19. Applicant also argues against the 112 2nd paragraph rejections but the examiner also maintains that claim 1 is vague. Applicant argues that a specific example shows the optical

precursor material being used in the electrospun polymer before it is formed however this does not cure the deficiency in the claim. The claim is confusing in that it not clear if the optical material is in the polymer solution before electrospinning or if it is coated or doped onto the fiber after formation (i.e. coated or doped into **the** electro**spun** nanofiber). If applicant intends to claim 1 to mean that the material is in the polymer solution before electrospinning the claim should be amended to clearly convey this intention. The new amendment also adds another level of confusion as is explained in the new 112 2nd paragraph rejection.

20. Applicant then argues against the prior art references. Applicant argues against Goldstein on the grounds that it does not disclose electrospinning; however Dzenis discloses that electrospinning is a known process for producing the ultrafine fibers desired in Goldstein. Applicant argues against Dzenis on the grounds that it does not disclose incorporating the optical material into the polymer solution; however Sennet discloses that adding additives to the solution, such as the additives disclosed in Goldstein, before electrospinning was also known. Applicant argues against Sennet on the grounds that it does not disclose the rare earth additives; however Goldstein discloses these additives. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

21. Taken as a whole, the references read on the instant claims. Goldstein discloses carbonized fibers with rare earth additives and discloses that the fibers should be as small as possible but does not disclose electrospinning. Dzenis discloses that to create ultrafine fibers

electrospinning was a known process. Also Sennet discloses that in electrospinning operations any additives can be incorporated into the solution before spinning which would save an extra step and more evenly distribute the additives into the fibers (as opposed to coating the fibers after spinning). Hence the references related to each other without hindsight reasoning. Dzenis teaches a way to make the fibers of Goldstein and Sennet teaches a way to incorporate the additives of Goldstein into the fibers produced by the process of Dzenis.

22. Applicant argues against the Tatarchuk reference in saying that the catalysts are loosely dispersed. First, the examiner notes that no specific citation to Tartarchuk is made to support this allegation. Second, there is no limitation in claim 6 related to how tightly packed the catalyst coated onto the fibers must be. Lastly, the catalyst additive would be considered an additive and would be obviously incorporated into the polymer before being spun for the same reasons that the rare earth additives would be, as explained above with respect to Sennet.

23. Regarding applicant's arguments related to claims 9-14, while Milstein does not disclose the electrospinning limitations, as has been explained above, the Goldstein, Dzenis and Sennet references teaches these limitations. The Milstein reference is only used to show that it would have been obvious to have altered the relative amounts of the rare earth oxides contained in the fibers.

24. Lastly the applicant makes general arguments against the rejections of claims 1 and 21 with only the Dzenis and Elbert references. The examiner believe the applicant may have thought the Elbert reference was merely added to the Goldstein, Dzenis and Sennet references above; however this is not the case. The Elbert and Dzenis references, by themselves, read on the independent claim (and claim 21). The examiner included this rejection to show that claim 1

does not require carbon fibers or rare earth elements and can be read upon simply by an electrospun fiber which incorporates any type or optical material, even a general pigment. While the Goldstein reference reads on the heart of applicant's invention (as detailed in the dependent claims) the independent claims do not posses any of the critical limitations that define the scope of the applicant's invention (i.e. the limitations that are expressed in the dependent claims). Hence applicant should be aware that many of the arguments above related to rare earth additives and carbonization of electrospun fibers are related to aspects of the invention that are not currently in the independent claim. For this reason the independent claim can also be read upon simply by an electrospun fiber with pigments therein.

Conclusion

25. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MICHAEL B. NELSON whose telephone number is (571) 270-3877. The examiner can normally be reached on Monday through Thursday 6AM-4:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Sample can be reached on (571) 272-1376. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Patricia L. Nordmeyer/
Primary Examiner, Art Unit 1783

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